

Applic. No.: 09/483,737
Amdt. Dated October 31, 2006
Reply to Office action of August 1, 2006

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Reconsideration of the application is requested.

Claims 1, 9-10, and 15 remain in the application. Claims 1 and 15 have been amended. Claims 2-8, 11-14, and 16-17 have been previously cancelled. Claims 1 and 9-10 have been previously withdrawn. Rejoinder of claims 1 and 9-10 has been requested.

In item 3 on pages 2-3 of the above-mentioned Office action, claim 15 has been rejected under 35 U.S.C. § 103(a) as being unpatentable over Kurokawa et al. (JP 63-136533) in view of Komata et al. (JP 2-15897) and Bacon et al. (US 5,234,153).

As will be explained below, it is believed that the claims were patentable over the cited art in their original form and the claims have, therefore, not been amended to overcome the references. However, the language of claims 1 and 15 has been modified to clearly recite the advantage of the invention of the instant application and to explicitly support Applicants' argument.

Before discussing the prior art in detail, it is believed that a brief review of the invention as claimed, would be helpful.

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Claim 15 calls for, inter alia:

a solder containing at least two components with at least two metal-containing constituents including a first constituent X being formed of a precious metal and a second constituent Y being consumed during a soldering operation by one of reacting and being dissolved in materials which are to be joined, and said solder having a hypereutectic concentration of said second constituent Y;

a substrate; and

a semiconductor chip having a rear side and an adhesive or diffusion barrier provided on said rear side, said adhesive or diffusion barrier being provided directly on said solder;

said semiconductor chip being secured at said rear side to said substrate by one of alloying and brazing using said solder to form a chip-substrate connection by said solder;

said solder containing a gold-tin compound (AuSn) having a composition by weight of Au to Sn of 70 to 30 and forming a layer having a thickness of from about 1 μ m to about 2 μ m;

Sn contained in said solder diffusing away from said solder into adjoining layers, loss of Sn providing a continuous reduction in a melting temperature during a soldering procedure.

Kurokawa et al. describe a semiconductor pellet with gold-tin alloy. A hypereutectic concentration of tin is not disclosed in Kurokawa et al.

Komata et al. describe a hypereutectic gold-tin alloy, but not in connection with a semiconductor device (see the figures).

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Therefore, there is no incentive or motivation for a person skilled in the art of semiconductor to combine the teaching of Komata et al. with that of Kurokawa et al.

The gold-tin solder of the invention of the instant application is at least 2.5 times thinner than the solder thickness of Bacon et al.

A person skilled in the art, even if using the teaching of Komata et al. (hypereutectic concentration of tin in the solder) in the state of art of Kurokawa et al. on the solder composition, would obtain a granular filler of a desired mass as taught by Komata et al.

Even taking Bacon et al. into consideration (incorporation of a relatively thin solder), a combination of the cited documents would not lead to invention of the instant application.

The invention of the instant application deals with the use of gold-tin solder having a hypereutectic concentration of tin. An important aspect is that Sn diffuses away from the solder, for example, into adjacent metal layers of the substrate. The loss of Sn provides a continuous reduction in the melting temperature during the soldering procedure.

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In addition, the references Komata et al. and Bacon et al. have been discussed in detail in numerous previous responses, the relevant part of which is incorporated herewith.

It is accordingly believed to be clear that none of the references, whether taken alone or in any combination, either show or suggest the features of claim 15. Claim 15 is, therefore, believed to be patentable over the art.

In view of the foregoing, reconsideration and allowance of claim 15 are solicited. Rejoinder of method claims 1 and 9-10 is requested upon allowance of product claim 15 under MPEP 821.04 ("if applicant elects claims directed to the product, and a product claim is subsequently found allowable, withdrawn process claims which depend from or otherwise include all the limitations of the allowable product claim will be rejoined").

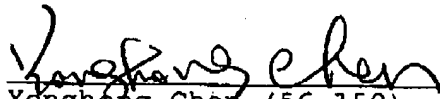
In the event the Examiner should still find any of the claims to be unpatentable, counsel would appreciate a telephone call so that, if possible, patentable language can be worked out.

If an extension of time for this paper is required, petition for extension is herewith made. Please charge any fees which might be due with respect to 37 CFR Sections 1.16 and 1.17 to

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the Deposit Account of Lerner Greenberg Stemer LLP, No. 12-
1099.

Respectfully submitted,


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